RARE
REGIONAL APPLIED RESEARCH EFFORT
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Through the Regional Applied Research Effort (RARE) ORD responds to the high priority, near-term research needs of EPA's Regional Offices. Annually, each EPA Region submits a project to an ORD Laboratory /Center where it is processed as an extramural research activity. Joint participation by staff from both the Laboratory and the Regional Office throughout the development of the project and through completion of the research fosters communication and collaboration between ORD and the EPA Regional Offices.

Region 8: Mercury Source Identification and Risk Management Recommendations for Fish Tissue Consumption from Livestock Ponds on the Cheyenne River Sioux Tribal Lands

Mercury contamination, and resultant health and environmental effects after mercury exposure, has been the focus of national and congressional importance in recent years for the USEPA . The agency has outlined the current state of knowledge for anthropogenic mercury emissions in the U.S., Hg fate and transport, exposure assessment, Hg health effects, ecological Hg effects, and evaluation of Hg control technologies and costs. Across Region 8 states, 55 fish advisories have now been issued and more investigations are pending.

In addition to the many non-point source pollution efforts to monitor and regulate mercury releases, the Superfund program has been looking at mining-related point sources of Hg contamination. In a collaborative 3 year study with the Cheyenne River Sioux Tribe Department of Environmental Protection (CRST DEP), and the Agencies' Environmental Response Team, Region VIII investigated Hg levels in fish tissues from the Cheyenne River and Lake Oahe in northwestern South Dakota. In 2000, the CRST released a fish advisory recommending less consumption of fish, especially for sensitive individuals within their population (pregnant and elderly).

One mitigating risk management recommendation from the CRST to its constituents was to consume fish from livestock ponds, which, having no influence from mining related activities and at the time, presumably would have lower concentrations of mercury in fish tissue. However, fish from livestock ponds with seemingly similar outward appearances had significant differences in accumulation in both the same species or within species of the same trophic position. Therefore, the lingering research questions are:

- Can the means be developed to predict which ponds will be safe to consume fish which inhabit them?
- Can these ponds act as mesocosms to help understand the bioconcentration of mercury in the larger water bodies such as Lake Oahe?

This research project will attempt to address the following issues:

1) Determine the source of mercury bioaccumulating in fish tissue. The primary focus will be to determine if the source of mercury ultimately accumulating in fish is either anthropogenically related to aerial deposition or naturally occurring sources related to geologic formation. In doing so, a quantitative prediction of mercury loading and bioaccumulation can be used to predict accumulation. Given the many factors which influence the fate and transport of mercury, these stock ponds can be used in a research mesocosm approach to help further understand mechanisms of bioaccumulation of methylmercury when there are no apparent point sources. Data collection will focus on input data needed for running models developed by EPA ORD at the National Exposure Research Laboratory in Athens, GA. These two models will be used to estimate total watershed loading and identify principle loading components

2) Make risk management recommendations to tribal members to reduce mercury exposure. The goal here will be to use the results from the first objective to make future fish stocking recommendations in ponds with the least potential for bioaccumulation of methylmercury. The researchers will determine if there are defined sizes of watersheds, geologic formation (i.e. soil types), or physical parameters which can adequately predict a critical health-based tissue burden in fish tissue.

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